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ABSTRACT

J. M. Richards (1989) has demonstrated that when individuals' reports about environments are aggregated to create environmental measures, the use of coefficient alpha to estimate single occasion reliability can be misleadingly elevated and that alpha cannot distinguish an environmental measure from a "disguised measure of individual differences." In this paper, the split-sample reliabilities of the Effective Schools Battery teacher psychosocial climate and population measures are examined. These reliabilities are compared with school-level alpha coefficients and with 1-year and 2-year retest reliabilities previously reported. Split-sample reliabilities are usually somewhat smaller than the alpha coefficients calculated at the school level for psychosocial climate measures, but they are nevertheless generally substantial. Population measures also show substantial split-sample reliabilities, implying that teachers are clustered within school environments in ways that are associated with their personal characteristics (individual differences). Five tables showing selected results from an examination of the correlates of these school environment and teacher population measures with student scholastic performance, attendance, and dropout are included to stimulate interest in a related research report. Fifteen references and two figures are included. (Author/TJH)

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The Internal Structure and Correlates of Some School Climate Measures

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Abstract

Richards (1989) has demonstrated that when individuals' reports about environments are aggregated to create environmental measures, the use of coefficient alpha to estimate single occasion reliability can be misleadingly elevated, and that alpha cannot distinguish an environmental measure from a "disguised measure of individual differences." In this paper I examine the split-sample reliabilities of the Effective School Battery teacher psychosocial climate and population measures; and I compare these reliabilities with school-level alpha coefficients and with one- and two-year retest reliabilities previously reported. Split-sample reliabilities are usually somewhat smaller than the alpha coefficients calculated at the school level for psychosocial climate measures, but they are nevertheless generally substantial. Population measures also show substantial split-sample reliabilities, implying that teachers are clustered within school environments in ways that are associated with their personal characteristics (individual differences).

Tables showing selected results from an examination of the correlates of these school environment and teacher population measures with student scholastic performance, attendance, and dropout are included to drum up interest in a related research report.

The Internal Structure and Correlates of Some School Climate Measures

As Richards (1978, 1988, 1989) has pointed out, psychologists are often confused by an "individual differences" fallacy in assessing the psychometric properties of environmental measures. Although information about the homogeneity and factor structure of items and scales examined at the individual level are uninstructive about the homogeneity and factor structure of environmental summary scores based on these items or scales, psychologists and educational researchers persist in developing measures and reporting psychometric data for environmental or "climate" instruments based on these individual-level analyses. For example, individual-level results are presented by Moos and Trickett (1987) for their Classroom Environment Inventory, by Proctor and Villanova (1984) for their widely used Connecticut School Effectiveness Questionnaire, and by many others (Andrews et al., 1987; South Carolina State Department of Education, 1987; Halderson, 1987).

One of the findings in Richards' (1989) most recent contribution towards clarifying our thinking on the measurement of environments is the compelling demonstration that estimates of the homogeneity of environmental measures based on environmental unit means as the basis of analysis can be quite misleading. To remind you of his results, alpha coefficients for environmental scales--estimated from

classroom-level item means for *randomly composed classrooms*--were substantial. These alphas approximated the alphas for scales estimated at the individual level. Because his synthetic classrooms were randomly composed, the "informants" were providing information in response to requests about random classrooms (i.e., their real classrooms), and so the reliability of the measures should have been near zero.

They are not zero because individuals' responses to items are correlated at the individual level and the individuals' item responses were not *independently* randomly assigned to classrooms. What this finding--which was surprising both to Richards and to me--means is that alpha coefficients for survey data in which individuals provide more than one piece of information about the environment can include reliable individual-difference variance in reliability estimates for composites scored at the environment level. Alphas calculated at the environment level can therefore provide inflated estimates of the reliability of environmental measures.

Richards' (1989) Table 2 shocked me so much that I decided to make my planned presentation available to you in printed form (Gottfredson & Gottfredson, 1989b; Gottfredson & Stewart, 1989). Instead I will try to build on Richards' recent paper and describe some further exploration of the reliability of the Effective School Battery (Gottfredson, 1984; ESB) using the split-sample technique.

Then, I will take a few minutes to describe some correlates of these same ESB scales.

The ESB is an instrument I developed for two main purposes: (a) to evaluate school-based programs intended to ameliorate the risk of delinquency, dropout, and school failure, and (b) to provide information that stimulates organization development in schools. The scales of the ESB were developed to assess characteristics of program implementation and program outcomes sought by program implementers with whom my colleagues and I have worked over the years. In developing these scales, I sought to devise measures of school climate that could be used to supplement measures of academic outcomes with measures of the quality of school environments, adolescent socialization, and teacher attitudes and practices.[1]

The ESB teacher survey is intended to measure dimensions of (a) school psychosocial climate and (b) teacher population characteristics. Conceptually, school climate is a property of the school. I regard individual differences in perceptions of school climate as error or "noise." In contrast, a teacher characteristic is a property of an individual teacher, and true score variability should reflect individual differences within schools. Conceptually, it is an

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[1]The ESB is composed of both teacher and student surveys. Only the teacher surveys are examined here.

empirical matter whether or not segregation according to individual differences or school effects produce variability among schools in these population characteristics.

The nine psychosocial climate scales and the seven population characteristic scales of the ESB teacher survey are described in Figures 1 and 2, respectively. Details of the development of the ESB are reported in the *Manual* (Gottfredson, 1984). Briefly, the population characteristics scales were based on item analyses conducted in the usual way at the individual level. I tried to build scales measuring relevant theoretical constructs that measured individual differences in personality, attitudes, and self-reported behavior. Job satisfaction is an example of such an individual-difference variable. I tried to have items call for reports about the self ("I like my job" for example). In using these population scales to characterize a school's population, individual scale scores are averaged. These are useful environmental descriptors to the extent that the people make the place (Astin & Holland, 1961; Schneider, 1987). If a program improves teacher job satisfaction, then the Job Satisfaction mean score should go up. The standard error of the mean summarizes the efficiency of the estimate of this mean.

In contrast, I tried to use candidates for measures of psychosocial climate that call for reports about the place ("The student government makes important decisions"). Scales were

constructed based on item analyses at the school level of analysis. That is, item responses were aggregated to the school level and then their correlations were examined. In scoring scales, items are aggregated to produce school means and then these means are summed to produce scores.[2] This approach was intended to select items that measured differences among schools rather than differences among teachers. I then examined scale correlations and reliabilities at the school level using such techniques as coefficient alpha.

Richards' recent paper is extremely important because it means that despite the school-level item analysis and despite the attempt to avoid personality-like items (which, by the way, I found difficult), the alpha reliabilities I have reported could be misleading.

Fortunately, I happened to have data for 68 schools which had recently been assessed using the ESB by my desk as I read Richards' (1989) paper. These are all the schools in a county-wide school district, and they were assessed in 1988 as part of an action research project (Gottfredson & Gottfredson, 1989a).

The corrected split-sample reliability coefficient (which I propose we henceforth call the Richards coefficient) was computed by

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[2]Incidentally, the slight variations in observed setting means in Richards' (1989) Table 1 probably result because a mean of means when groups differ in size is not generally equal to the simple mean across all groups.

assigning even numbered teachers in each school to one half-sample and odd numbered teachers to a second half-sample. Then scores were computed for each half-sample within each school as I described earlier. Population scores for each half are the mean of the individual-difference scores for that half; psychosocial climate scores for each half are means of the item means for that half. Split-sample means were correlated and corrected using the Spearman-Brown formula.

The results are shown in the first column of Table 1. In general, the split-sample reliabilities are moderate (.62) to high (.88) except for the scale labeled "Avoidance of the Use of Grades as a Sanction." Interestingly, this composite is formed from two "I" items, it has not always fared well in earlier examinations of its properties (Gottfredson, 1984), and practical experience implies that its interpretation and use is cumbersome and difficult.

In general, the split-sample reliabilities for the individual difference measures are lower than the psychosocial climate measures. Most of them are far from zero, however. This implies that people are clustered within schools in a manner that is not independent of their attitudes and behaviors. Were this not true, the coefficients would be near zero as they were for the randomly composed "classrooms" in Richards' Table 2. Notice that the coefficient for Professional Development is highest and that it is likely that if one teacher in a

school is exposed to a staff development experience it is likely that most would be exposed. The split-sample coefficient for Nonauthoritarian Attitude is lowest, and this seems closest to a pure personality measure.

The second column in Table 1 summarizes the homogeneity coefficients I reported in the ESB *Manual*. In most cases the alphas are higher than the Richards coefficients. The alphas are from different samples, and some differences would be expected for this reason. Nevertheless, the pattern in results suggests that the school-level alphas tend to overestimate the reliability.

The remaining two columns show data I have reported previously about the retest reliability of these scales. It may be useful to reflect what is treated as error in these coefficients and what is not treated as error. Unsystematic variation over time is treated as error, but these re-test reliabilities <u>for the psychosocial climate scales</u> do not necessarily exclude all individual differences variance. To the extent that the inhabitants of the environment do not all turn over during the time interval <u>and</u> that item responses at time 1 are correlated with item responses at time 2 *at the individual level* and that people are clustered within environments in the basis of these stable individual differences or on the basis of a characteristic that is correlated with them, these re-test reliabilities can be inflated.

Of course the retest coefficients for the population characteristics do include individual differences variance. They are intended to. In theory, one can increase the average job satisfaction in an environment by replacing unhappy people with happy people, for example. To the extent to which people are clustered within environments on the basis of the measured characteristics or on the basis of a characteristic correlated with a measured characteristic--for whatever reason--then the Richards coefficients will be non-zero. And to the extent that they stay there the retest coefficients will be non-zero. Among the reasons for clustering could be differential assignment to environments, differential attrition from environments, segregation of one kind or another, self-selection or choice of environments, or something the environments do to the people (i.e., environmental effects).

How would one improve on the retest estimate for a psychosocial climate measure? Split the populations of time 1 inhabitants into random halves and identify members of each half. Randomly assign newcomers to the environment at time 2 to half-1 or half-2, and assign persisters to the same half they were assigned at time 1. Correlate the time-1-half-1 scores with the time-2-half-2 scores and the time-1-half-2 scores with the time-2-half-1 scores. Then step up the mean of these correlations. I am sorry to report that I have not had the time to do this for you.

There are some more tables I want to show you briefly to try to get you interested in the paper I had planned to give today (Gottfredson & Gottfredson, 1989b), which you can pick up from the front table. Table 2 shows correlations between the psychosocial climate scales we have just been discussing and some academic achievement outcomes for elementary school children. All those stars in the table are dazzling, but what this table does not reveal is that both ESB scores and scholastic performance aggregates are efficiently predicted by the affluence and ethnic composition of schools. Table 3 shows that net of these characteristics the correlations tend to be much smaller. Whiz-bang correlations in highly aggregated data are not hard to come by but they can be hard to interpret (Gottfredson, 1979).

Table 4 shows correlations between the ESB scales we have been discussing and school attendance, and Table 5 shows correlations with dropout rates.

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Table 1

Single Occasion and Re-Test Reliabilities of Two Kinds of Environmental Assessments Contained in the ESB

ESB scale	Corrected split-sample	School-level alpha	One-year retest	Two-year retest
Psychosocial climate				
Safety	.81	.94	.75	.51
Morale	.80	.92	.62	.65
Planning & action	.69	.88	.51	.33
Smooth administration	.78	.92	.56	.55
Resources	.81	.84	.72	.76
Race relations	.77	.76	.69	.60
Parent/community involvement	.88	.80	.53	.17*
Student influence	.62	.83	.59	.76
Avoidance of grades as sanction	.38	.74	.45	.28*
Population characteristic				
Prointegration attitude	.55	NA	.39	.64
Job satisfaction	.49	NA	.66	.41
Interaction with students	.59	NA	.60	.71
Personal security	.66	NA	.36	.19*
Clasroom orderliness	.53	NA	.46	.43
Professional development	.75	NA	.47	.62
Nonauthoritarian attitude	.22	NA	.31	.47
Number of schools	(68)	(52-65)	(46-52)	(33-38)

* Not significantly different from zero.

NA = not applicable. The scores are means of individual scores.

Note. Corrected split half reliabilities are from the population of 68 schools in a county-wide school district. School level alphas are calculated from school-level (aggregated) item means, and are the medians of two alphas (52 to 65 schools) reported for two diverse samples of schools in the ESB *Manual*. The re-test reliabilities are from a diverse sample of schools that were assessed one and two years apart, and are taken from the ESB *Manual*.

Table 2

Correlations Between Student Characteristics or Educational Outcomes and the Teacher Climate Scales of the Effective School Battery: Grade 3 (N = 41 to 42 Schools)

Schools' Student Population Characteristics or Educational Outcomes	Effective School Battery Score								
	Safety	Morale	Planning & Action	Smooth Admin.	Resources	Race Relations	Prnt/Cmty Involv.	Student Infl.	Avoid. Grd. Sanction
Mean student age	-.55***	-.37*	-.40**	-.27	-.48***	-.53***	-.62***	-.25	-.20
Percentage never retained	.47**	.44**	.48***	.36*	.52***	.48***	.68***	.32*	.14
Percentage white	.48***	.35*	.25	.18	.42**	.42**	.62***	-.02	.24
Percentage free/reduced lunch	-.58***	-.47**	-.35*	-.26	-.48***	-.46**	-.75***	-.13	-.21
Percentage male	-.23	-.17	-.26	-.14	-.14	-.10	-.14	-.06	-.05
Mean reading score	.61***	.50**	.38*	.19	.40**	.46**	.73***	.26	.19
Mean math score	.68***	.52**	.43**	.18	.40**	.44**	.70***	.34*	.27
% meeting reading criterion	.54***	.34*	.18	.04	.26*	.27	.47**	.14	.21
% meeting math criterion	.69***	.52**	.35*	.21	.40*	.39*	.60***	.29	.41**
% meeting math criterion on time	.64***	.60***	.58***	.37*	.54***	.54***	.78***	.40**	.26
% meeting reading crit. on time	.56***	.52**	.54***	.31	.51**	.55***	.74***	.39*	.21
Mean reading, on-time students	.56***	.48**	.36*	.16	.36*	.50**	.69***	.21	.14
Mean math, on-time students	.66***	.52***	.41**	.20	.37*	.53***	.69***	.28	.18

* $p < .05$
** $p < .01$
*** $p < .001$

Table 3

Partial Correlations of Effective School Battery Scales with Educational Outcomes Controlling for Percentage Black and Percentage of Students Receiving Free or Reduced Lunch: Grade 3 (N = 41 Schools)

ESB Scale	Mean score: reading	Mean score: math	% meeting criterion: reading	% meeting criterion: math	% meeting criterion on time: math	% meeting criterion on time: reading	Mean score, on-time students: reading	Mean score, on-time students: math
Safety	.27	.46**	.28	.52**	.36*	.21	.20	.44**
Morale	.20	.25	.04	.32*	.39*	.26	.17	.26
Planning & Action	.14	.23	-.08	.17	.48**	.41**	.10	.20
Smooth Administration	-.07	-.05	-.19	.06	.25	.15	-.11	-.02
Resources	.01	.10	-.06	.15	.29	.26	-.04	.05
Race Relations	.18	.21	.00	.17	.35*	.37*	.28	.36*
Parent/Cmty. Involvement	.27	.33*	-.01	.26	.48**	.38*	.22	.32*
Student Influence	.18	.24	.00	.27	.42**	.38*	.10	.15
Avoid. Grades Sanction	.07	.23	.14	.38*	.18	.11	-.01	.10
Pro-Integration Attitude	.23	.38*	-.04	.09	.41**	.47**	.14	.33*
Job Satisfaction	-.04	.06	-.05	.23	.30	.27	-.06	-.05
Interaction with Students	-.12	-.06	-.05	-.10	-.28	-.20	-.17	-.23
Personal Security	.49**	.52**	.24	.51**	.54**	.42**	.47**	.52**
Classroom Orderliness	.24	.43**	.18	.55**	.33*	.20	.24	.30
Professional Development	.05	.10	.02	.26	.36*	.26	-.04	-.01
Nonauthoritarian Attitude	.31	.36*	.15	.39*	.46**	.38*	.24	.32

* $p < .05$
** $p < .01$

Table 4

Correlations of Effective School Battery Scales with Student Attendance: Elementary, Middle, and High Schools

ESB Scale	Zero order correlations				Partial correlations	
	Elementary (N = 42)	Middle (N = 15)	High (N = 11)	Total (N = 68)	Elementary (N = 42)	Middle & High (N = 26)
Safety	.55***	.55*	.29	.53***	.55***	.43*
Morale	.51***	.48	.34	.42***	.44**	.41
Planning & Action	.36*	.32	.43	.43***	.28	.30
Smooth Administration	.29	.08	-.13	.20	.17	.00
Resources	.24	.40	-.34	.12	.14	.00
Race Relations	.39*	.24	.25	.32**	.36*	.24
Parent/Cmty. Involvement	.40**	.28	.55	.40***	.27	.26
Student Influence	.38*	.36	.40	.43***	.27	.33
Avoid. Grades as Sanction	.26	.32	.51	.45***	.35*	.49*
Pro-Integration Attitude	-.08	.21	.18	.11	.00	.20
Job Satisfaction	.10	.45	.33	.20	-.08	.36
Interaction with Students	.00	-.22	.16	-.42***	-.19	-.12
Personal Security	.51***	.46	.04	.44***	.47**	.27
Classroom Orderliness	.29	.63*	.42	.08	.22	.51*
Professional Development	.25	.24	.47	.38***	.20	.37
Nonauthoritarian Attitude	.38	.14	.34	.36**	.42**	.10

[a]Controlling for percentage white and free and reduced lunch for elementary schools and also for level for middle and high schools.

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 5

Correlations of Effective School Battery Teacher Psychosocial Climate Scales with Dropout Rate: Middle and High Schools

ESB Scale	Zero order correlations			Partial r
	Middle (N = 15)	High (N = 11)	Total (N = 26)	Total (N = 26)
Safety	-.78***	-.20	-.61***	-.66*
Morale	-.64**	-.44	-.61***	-.48
Planning and Action	-.18	-.16	-.42*	-.13
Smooth Administration	.09	-.35	-.38	-.16
Resources	-.45	.03	-.53**	-.26
Race Relations	-.04	.06	-.06	-.19
Parent/Community Involvement	-.50	.17	-.38	-.10
Student Influence	-.32	.09	-.24	-.18
Avoidance of Grades as Sanction	-.57*	-.50	-.57**	-.69**
Pro-Integration Attitude	.25	.35	.02	.14
Job Satisfaction	-.46	-.14	-.47*	-.37
Interaction with Students	.08	-.23	.48*	.14
Personal Security	-.44	-.37	-.31	-.33
Classroom Orderliness	-.66**	-.05	-.13	-.51
Professional Development	-.23	.46	-.29	-.44
Nonauthoritarian Attitude	-.18	-.26	-.30	.13

Note. Dropout rates are annual incidence rates for grades 7 and 8 for middle schools and for grades 9 - 12 for high schools.

[a]Controlling for percentage white, percentage free or reduced lunch, and school level.

* $p < .05$ ** $p < .01$ *** $p < .001$

Figure 1

ESB School Psychosocial Climate Scales--Teacher Reports

Scale (No. of Items)	Meaning
Safety (10)	Indicates how safe teachers report the school environment to be. A high score means that teachers tend to report most places in the school to be safe, and a low score means that teachers report many places in the school to be unsafe.
Morale (11)	Indicates the degree of enthusiasm of a school's faculty and faculty confidence in the school. A high score means that teachers are likely to be enthusiastic and to participate in the development of new programs. A low score suggests that many faculty share a sense of resignation about the school and little confidence that much can be done about it.
Planning and Action (9)	Indicates teacher reports of the degree to which the school takes an experimenting or innovative approach to planning school programs.
Smooth Administration (12)	Indicates how teachers perceive the school administration. High scores imply that teachers perceive that they get the help they need to do their jobs when they need it.
Resources (4)	Indicates whether teachers report adequate instructional supplies and other resources or whether they report difficulty in obtaining needed teaching supplies.
Race Relations (2)	Indicates (in integrated schools) how well different ethnic groups get along. In schools with students and faculty of only one ethnic group, this scale should be disregarded.
Parent/Community Involvement (6)	Indicates the degree to which the school uses community resources in its programs.
Student Influence (5)	Indicates teacher perceptions of the extent to which students participate in school decisions.
Avoidance of Use of Grades as a Sanction (2)	Indicates the extent to which teachers avoid lowering grades in response to student misconduct--a generally poor practice.

Figure 2

ESB Teacher Population Characteristics

Scale (No. of Items)	Meaning
Pro-Integration Attitude (4)	Indicates average teacher attitude toward integrated education. A high score suggests that teachers view integrated education in a positive way; a low score suggests that the average teacher may be somewhat insensitive to issues of racial equity.
Job Satisfaction (3)	Indicates how the average teacher feels about his or her job. A high score implies that teachers typically like their jobs in the school; a low score indicates that teachers typically dislike their jobs.
Interaction with Students (6)	Indicates how much positive social interaction the average teacher reports having with students. A high score implies that many teachers report friendly interaction with students.
Personal Security (8)	Indicates the average teacher's experience of personal victimization. In a low-scoring school, relatively many teachers report receiving obscene remarks or gestures, threats, thefts, or even attacks. A high score implies teachers rarely experience indignities or victimization in the school.
Classroom Orderliness (2)	Indicates how orderly the average teacher's classroom is. A high score implies classrooms are typically orderly; a low score implies that disruption interferes with teaching in many classes.
Professional Development (8)	Indicates how much exposure to continuing education the average teacher in the school has had in the past year.
Nonauthoritarian Attitude (3)	Indicates the average teacher's attitude about student-teacher authority relations. A low score implies many teachers have a punitive, moralistic attitude about student misbehavior. A high score implies many teachers have a more flexible attitude about coping with student misconduct.